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ABSTRACT

Using multiple longitudinal data from Chicago, Illinois, public elementary schools, this study identifies correlates of student achievement through multiple linear regression. The study combines the approach taken in large-scale correlational studies of school achievement with a study of the variables identified in effective schools research. It is based on questionnaires completed by thousands of Chicago public school teachers from 422 elementary schools and student achievement data from Illinois records. The analysis shows that school variables make a significant contribution to the explained variance in student mathematics achievement. The contribution of school climate variables is about 19%, and teacher beliefs contribute about 24%. The contribution of socioeconomic variables is 57%. When controlling for prior achievement in mathematics, socioeconomic variables continue to be the major contributor to the explained variance in mathematics instruction. An appendix contains a list of school variables considered in the survey. (Contains 47 references.) (SLD)

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# Correlates of School Achievement in Chicago Elementary Schools

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**Purpose**

This paper is based on multiple longitudinal data sets on Chicago public elementary schools on student achievement, student characteristics, and teacher questionnaires collected in the years 1994 to 1997. Multiple linear regression will be used to identify correlates of student achievement in Chicago public schools.

There have been many changes in the Chicago public schools since implementation of the school reform law. These changes include increased local control in the governance of individual schools through Local School Councils; increased community involvement both in the governance and financing of schools; and increased accountability and intervention for poorly performing schools. By combining diverse data sets that cover most of the years since school reform was initiated, this study identifies important school characteristics that have affected student achievement during this decade of Chicago school reform.

**Theoretical Framework**

Two different research traditions on the effects of schooling arrive at widely differing conclusions about the major factors associated with student achievement: school characteristics or student socioeconomic and ethnic background. In large-scale, cross-sectional studies of school-wide student achievement, variables that measure the socioeconomic, racial and ethnic composition of the student body tend to dominate the analysis (Coleman, 1966, 1990; Jencks, 1998). Conversely, the effective schools research, based on a more in-depth study of a smaller number of schools – often outliers in the regression of student achievement with socioeconomic variables – documents characteristics of schools and principals as major factors in student achievement (Cruickshank, 1986; Edmonds, 1979, 1981, 1984; Levine, 1990; Lezotte, 1985, 1989, 1996; Purkey & Smith, 1983; Reed, 1998; Zigarelli, 1996).

A third type of analysis, the recent longitudinal research based on the Tennessee Value-Added Assessment System, shows that student growth in achievement is unrelated to socioeconomic variables, but strongly related to the characteristics of their teachers (Sanders & Horn, 1994; Wright, 1997). Although some residual effects of background factors remain in the analysis of longitudinal data on student achievement in Illinois, these effects are small (Bryk, et al., 1998). School and principal characteristics, particularly those identified in the effective schools research, are likely to play a more important role in the analysis of large-scale longitudinal data. The data in this study contain longitudinal information on student achievement in mathematics (1994 to 1998), as well as teacher characteristics and school climate measures obtained from system-wide surveys.

This study, then, combines the approach taken in large-scale correlational studies of school achievement with a study of the variables identified in the effective schools research. This is possible because the questionnaires on which this study is based – questionnaires filled out by thousands of teachers in Chicago public elementary schools – were designed in large part based on the results of effective schools research. Thus, it was possible to combine variables that measure characteristics of teachers and schools identified as important in this research tradition with data files that contain information on student achievement as well as student characteristics. Because all data for this study are aggregated to the school level, this analysis does not answer questions about factors associated with individual student learning.

**Methods of Inquiry**

This is a quantitative study in which the school is the unit of analysis. The level of measurement of most major variables is interval or better. These include the standardized achievement scores collected by the Illinois State Board of Education (ISBE) in the Illinois Goal Assessment Program (IGAP scores); demographic school variables describing student characteristics; and scale variables measuring aspects of school climate created by a Rasch analysis (Wright, 1992). Statistical analysis providing descriptive data as well as multiple linear regressions is presented. The dependent variable is student achievement in mathematics; the independent variables are school and teacher characteristics and socioeconomic variables.

The School Sample

Data collected by the Consortium on Chicago School Research on teachers (1997) are used in this analysis. The Consortium survey included a population of 477 elementary schools, all of which were invited to participate in the survey and received questionnaires for principals and teachers. To avoid having to rely on a convenience sample of schools that volunteered to return surveys, the Consortium also generated an analytic sample of randomly selected schools, stratified by area and socioeconomic level to assure equal representation of all areas of the city and all economic groups. The analytic sample consists of 80 schools; despite intensive efforts, 12 of these did not return data, and were replaced with adjacent alternate schools. As a result, the response rate for schools in the analytic sample is 100% (Consortium 1997).

Overall, 422 (88%) of the 477 elementary schools did participate in the survey, with an average response rate for teachers of 63% within these schools. Schools in the analytical sample were compared with other schools on three characteristics: percentage of low-income students, percentage at or above national norms on the 1996 ITBS, and racial composition. "Virtually no differences were found among the various groups or the various items. Therefore, we are confident that the analytic and volunteer samples are demographically representative of the Chicago Public Schools" (Consortium 1997, p. 17).

An analysis of the variables obtained in the teacher survey showed that their means did not differ significantly between sample and non-sample schools. Sample schools, however, have significantly lower mathematics scores than non-sample schools. Conversely, the response rate of elementary school teachers is positively correlated with school mathematics IGAP scores. In the data analysis, two variables, a dummy variable representing sample schools and teacher response rate, were entered into the equation. Neither of these variables was significant, and their presence did not alter the significance of other variables. In this study, the entire population of 422 schools returning information was therefore used in the analysis.

Data Sources

Topics covered in the 1997 teacher survey that were used in this study include questions about school leadership, governance, Community relations, assessment of student ability to learn, and the professional learning community of the school. These variables are similar to those identified as important in the effective schools research.

Composite variables were created from individual item responses through Rasch analysis (Wright, 1992), a way of creating interval scales based on a latent trait model using level of

endorsement of each item in the scale to obtain scale results for individuals (Consortium, 1997). These measures were aggregated at the school level by obtaining average scores.

The Illinois State Board of Education (ISBE) publishes student achievement data and school characteristics for Illinois schools annually. These are the same data distributed to individual schools as their "School Report Card." The School Report Card contains IGAP achievement data for reading, writing and mathematics ($3^{rd}$, $6^{th}$ and $8^{th}$ grades), and for social studies and science ($4^{th}$ and $8^{th}$ grades). Data are provided as standardized scores and as percentages of students who fail to meet, meet or exceed the State of Illinois Standards in each of the subjects. This analysis relies entirely on standardized scores.

Demographic data that describe student characteristics are derived from the Illinois School Report Card. These variables are based on reports sent by each of the schools to the Illinois State Board of Education (ISBE) and include the percentage of students receiving free and reduced lunches (percent low income), the racial and ethnic composition of the school, and student mobility rate. Information on attendance, truancy, and parent participation rates (reflecting the percentage of parents picking up school report cards) is also available on the School Report Card.

This researcher has maintained a data file of ISBE data since 1988. These data are reported in ASCII format, and some effort is required to convert them to more user-friendly form, in this case to SPSS files with labeled variables. The greatest problem in merging data sets from different years to create a longitudinal file involves changes in school names and identification numbers and the addition and deletion of schools. When merging these data, questions about problematic schools were resolved by calling the Chicago Public Schools for information, or by calling individual schools. As a result, a longitudinal data set is available for Chicago Public elementary schools for the years covered by the Consortium surveys.

As the Consortium on Chicago Public School Research maintains the anonymity of the schools, the Consortium merged the researcher's ISBE data with the Consortium data, replacing identifiable school ID numbers with numbers supplied by the Consortium. This process has resulted in a number of data sets, variables from which can be combined at will through a simple SPSS merge procedure.

Data Analysis Procedure

The question addressed in this paper is the relative weight of variables associated with school climate and variables associated with the demographic composition of the student body in affecting student achievement and changes in student achievement. The first step in this analysis was an identification of variables significantly correlated at the bivariate level with student achievement. The second step was to identify separately the group of variables in the demographic set (percent low-income, percent Black, percent Hispanic and mobility rate) and the group of school climate variables based on teacher responses, which remain significant in a multiple regression with student achievement (based on the t-value related to the slope of each variable). This provided the most important variables within each group predicting student achievement.

The significant variables from each of the two sets – socioeconomic and school climate – were then entered into a regression analysis simultaneously. Variables that were no longer significant (t-test) were excluded from this analysis. A third variable, school selectivity, was also added to the analysis. Finally, student achievement in 1994 was entered as an independent variable to assess the effects of school and socioeconomic factors on changes in student achievement.

The independent contribution of each group of variables – school climate variables, socioeconomic variables, and school selectivity – to the explained variance in student achievement was assessed using a procedure described by Chevan and Sutherland (1991) and referred to as "hierarchical partitioning." This procedures was designed to allocate the contribution of individual variables to the explained variance. It was modified for this study to compute the contribution of groups of variables instead.

**Educational Significance**

The belief that all students can achieve academic excellence has become dominant in education (Arnn & Mangieri, 1988; Barth; 1990; Crosby & Owens, 1991; DuFour & Eaker, 1992; Faidley & Musser, 1989; Lezotte, 1996). The discrepancy between this ideal and the reality documented in the many studies showing large differences in student and school achievement based on demographic factors is a major dilemma in American education. Accepting the reality of these differences as normative means condemning many poor and minority students to low academic achievement and failure. The effective schools literature provides a blueprint for improving student achievement in all schools. The current research is an effort to find support for the results of the effective schools research based on a large-scale statistical study of the Chicago public school system.

This study also provides information on Chicago schools, school climate and student achievement during a time of systemic school reform. It thus makes a contribution to the large body of existing research (e.g. Bryk et al., 1993, Bryk, Sebring et al., 1998, Bryk, Easton et al., 1998; Designs for Change, 1998; Sebring et al., 1995), both quantitative and qualitative, documenting the effects of one of the major efforts at school reform in the nation, that of the Chicago public schools.

**Results of the Study**

Correlates of Student Achievement in 1997

Given the complexity of the data collected by the Consortium on Chicago School Research on Chicago public schools, the first goal of this paper is to determine if school factors measured by this research contribute significantly to school achievement, independent of student characteristics. An analysis model was developed using mathematics achievement of students. This analysis is static, looking at student characteristics, school variables and student achievement at one point in time only, at the time of the 1997 Consortium study. Finally, the analysis was extended to include 1994 mathematics achievement to determine if school variables and student characteristics are associated with change in mathematics achievement.

Description of the Variables

Student characteristics are reported to the Illinois State Board of Education (ISBE) by schools and then published as part of the School Report Card data. Variables included in this research are the percentage of low-income students (students receiving free and reduced lunches), the percentage of Black students, the percentage of Hispanic students, and the mobility rate of students in each school for 1997.

Student achievement is measured by the Illinois Goal Assessment Program (IGAP), specifically scores in mathematics for each school. In 1997 and 1994, IGAP tests in mathematics were administered in the spring to third, sixth and eighth grade students. For this study, scores for the three grades were averaged. This allowed inclusion in this study of all schools with at least one of these three grade levels.

One of the school variables included in this study is the selectivity of the school. Schools were characterized as selective if they admitted students by application, whether the selection involved testing or lottery. Twenty-six schools in this study were identified as being selective. This variable may reflect unmeasured background characteristics of students and their families, but was treated separately in the analysis.

All of the school variables are based on teacher responses to the Consortium survey in 1997. Composite variables were created from individual item responses through Rasch analysis (Wright, 1992), a way of creating interval scales based on a latent trait model using level of endorsement of each item in the scale to obtain scale results for individuals (Consortium 1997, p. 21). These items were then averaged to obtain school scores. The 1997 survey included 25 scaled variables based on teacher responses. Many of these variables were not related to student achievement either at the zero-order level or as part of a more extensive set of variables. In the final analysis, five of these variables were included: Parent Involvement in School, Inclusive Leadership, Limits on Students' Capabilities to Learn, School Commitment and Focus on Student Learning.

Analysis of 1997 IGAP Mathematics Achievement

To assess the contributions of different variables to student achievement in mathematics, a method of partitioning the variance was used that allows an estimation of the contribution of each of the factors. It is based on partitioning the explained variance in the multiple regression in

such a way that the unique contribution to the explained variance of each variable, added to all possible equations involving all possible combinations of the other variables, is averaged. Chevan and Sutherland (1991) explain this technique, and Schafer (1992) provides a step-by-step procedure.

For this study, variables were grouped into four categories: Variables describing student characteristics were grouped together; these variables are measures of socioeconomic status (percent low income and mobility) and ethnicity (percent Black and percent Hispanic). Selectivity (a dummy variable) was treated as a separate category. Variables derived from teacher responses were divided into two categories. One of these categories, labeled "school climate," consisted of three individual variables: school commitment; focus on student learning; and inclusive leadership. The other category includes two variables, which reflect the teachers' assessment of students and parents: limits on students' capability to learn and parent involvement. Originally other categories were envisioned, such as school leadership, but variables measuring those school characteristics were not significantly related to mathematics achievement either at the zero-order level or once other school variables were added.

There were several different combinations of school variables that could have been selected for inclusion in this model. The choice of this particular model was, to some extent, arbitrary. One model was rejected because school climate variables that showed a positive correlation with mathematics achievement at the zero order became negative when combined with the major school climate variable, school commitment (for instance reflective dialog and teacher influence). This would be difficult to interpret and may indicate collinearity rather than a substantive finding. One such variable, inclusive leadership, remains in the model that was chosen. One reason this model was chosen was the opportunity to divide variables into two meaningful categories. The explained variance of all possible models was comparable, and differed by less than one percent. It should be noted that the major purpose of the current paper was to determine the relative importance of school climate variables and student background variables, and all of the possible models provide comparable results in this respect.

Table 1 shows the results of the regression analysis, with the average IGAP score in mathematics in 1997 as the dependent variable. The variables included in the equation explain about 78% of the variance in mathematics achievement, and the standard error of the estimate is about half of the standard deviation of the school IGAP score in mathematics. Data for this analysis were available for 386 elementary schools.

For an interpretation of these data, the unstandardized coefficients prove interesting. Among the school climate variables, focus on student learning has the largest effect on student achievement in mathematics, a finding that is in accordance with the effective school research. It should be noted all three of these Rasch variables have a possible maximum score of 10, with averages around six. Schools where the score for "focus on student learning" is at the maximum of 10 add, on average, 59 points to their average Mathematics IGAP score, which amounts to more than one standard deviation. Clearly school climate is an important factor in mathematics achievement. The negative coefficient for "inclusive leadership" is noteworthy but difficult to explain. This variable has a positive zero-order correlation with mathematics achievement, but the coefficient becomes negative once any of the other school climate variables is added. Another similar variable, "teacher influence," shows the same pattern in this position.

Table 1

Regression of School and Student Background Variables with
1997 Average School IGAP in Mathematics

Table of Coefficients

| | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|
| Variables | B | Std. Error | Beta | | |
| (Constant) | 322.174 | 19.683 | | 16.368 | .000 |
| School Climate Variables | | | | | |
| Focus on Student Learning | 5.894 | 1.805 | .159 | 3.266 | .001 |
| School Commitment | 4.685 | 1.798 | .138 | 2.605 | .010 |
| Inclusive Leadership | -2.313 | .917 | -.100 | -2.521 | .012 |
| Teacher Belief Variables | | | | | |
| Parent Involvement in School | 3.478 | 1.719 | .077 | 2.023 | .044 |
| Limits on Students' Capabilities to Learn | -6.255 | 2.416 | -.071 | -2.589 | .010 |
| Student Background Variables | | | | | |
| Percent Low-Income Students | -1.023 | .118 | -.406 | -8.702 | .000 |
| Mobility | -.267 | .079 | -.096 | -3.403 | .001 |
| Percent Black Students | -.469 | .085 | -.428 | -5.520 | .000 |
| Percent Hispanic Students | -.336 | .100 | -.245 | -3.346 | .001 |
| | | | | | |
| Selectivity | 20.331 | 6.105 | .094 | 3.330 | .001 |

Model Summary: $R = .881$, $R^2 = .776$, Standard Error of the Estimate = 22.43
Mean Math IGAP: 226.31; standard deviation: 47.10
$F(10,376) = 130.262$; $p < .001$

The belief of teachers that students' capability to learn is limited has devastating consequences for student achievement in mathematics. The actual maximum for this variable for these schools is 6.76; in a school with that score, the IGAP mathematics score is reduced by 42 points (6.76*6.255), almost one full standard deviation. The potential effect of parent involvement (as perceived by teachers) is 25 IGAP points in mathematics.

Percent low-income students is the most significant of the student background variables. Schools in which all students come from low-income families score an average of 102 points lower on the mathematics IGAP than schools with no low-income students; each increase of one percentage point in low-income students is associated with an average loss of about one point on the mathematics IGAP. Compared to all-white schools (which do not exist in Chicago), all-black schools average about 47 points lower on the mathematics IGAP, a little more than one standard deviation. It should be noted that Jencks (1998) documented a racial difference of one standard deviation on many academic tests. An increase in one percent of Hispanic students reduces the expected IGAP score by about 1/3 of a point. Selective schools average 20 points above non-selective schools on the mathematics IGAP test. It should be noted that selectivity was entered into the regression equation, but was left out of the partitioning of the variance. This variable probably represents a composite of school and student background effects – selective schools

have better resources, but also draw from a more motivated parent population than regular schools. It was left out to get a clearer picture of the separate contributions of student background and school variables.

The analysis of the regression table is interesting and clearly shows that variables other than student background have a significant impact on school outcomes in mathematics. However, it is difficult to estimate the relative importance of each of the variables or the groups of variables combined into factors. To provide another way to assess the contribution of each of the categories of variables on student mathematics achievement, a method of dividing the explained variance referred to as "hierarchical partitioning" (Chevan & Sutherland, 1991; Schafer, 1992) was used. It allows the explained variance (multiple R squared) to be partitioned into the independent contribution of each variable or each group of variables. Table 2 below shows this analysis.

Table 2

Hierarchical Partitioning of Explained Variance, Math IGAP 1997
Student Characteristics, School Variables, Teacher Beliefs and Selectivity

| Predictor Variables | Explained Variance Entered Alone | Unique Contribution | Independent Contribution | Percent Independent Contribution |
|---|---|---|---|---|
| School Climate Variables[a] | .352 | .032 | 0.149 | 18.65 |
| Teacher Beliefs[b] | .428 | .039 | 0.191 | 23.83 |
| Student Background[c] | .707 | .211 | 0.460 | 57.52 |
| Total | | | 0.800 | 100.00 |

[a] School Commitment, Focus on Student Learning, Inclusive Leadership
[b] Limited Student Capability to Learn, Parent Involvement
[c] Percent Low-income, mobility, percent black, percent Hispanic

The first row of Table 2 shows the explained variance contributed by the group of variables without any other variables in the equation; for one variable this would be the equivalent of the zero-order correlation squared. The second column shows the unique variance contributed by each set of variables. This is the difference in the multiple $R^2$ when each set of variables is added to all other variables already in the equation. The third column provides the independent contribution to the total variance of each of the sets of variables. It is expressed as a percentage of the explained variance in the fourth column. Student background variables account for more than half of the explained variance (57.52%). The three school climate variables, "focus on student learning," "school commitment," and "inclusive leadership" account for 18.65% of the variance in Mathematics IGAP scores. Teacher beliefs about student capability to learn and parent involvement account for 23.83% of the variance.

These data are important because they show that it is possible to separate the effects of student background characteristics from the effects of other school characteristics in a large-scale quantitative study. It could be argued that the addition of other variables measuring the socioeconomic status of students more effectively would negate the influence of the other school variables. However, the variance explained by the four student background variables is already

very large, explaining 70.7% of the variance in mathematics achievement. Thus, these are very powerful variables that are highly associated with student outcomes in mathematics, and it is unlikely that additional measures of student background would contribute more to the explained variance in mathematics achievement.

Improvement in Mathematics Achievement and School Climate

The foregoing analysis has demonstrated that school variables are significant factors in explaining student achievement in mathematics, even after controlling for the socioeconomic and ethnic composition of the student body. The question remains whether these variables are also associated with change in student achievement, and whether student background becomes irrelevant in accounting for student progress, as studies of students tracked in individual classrooms show (Sanders, 1992).

As the use of change variables in regression is problematic, change in mathematics achievement between 1994 and 1997 will be studied indirectly, by introducing the 1994 IGAP mathematics score with the other independent variables. This will assess the effect of these variables on the mathematics score in 1997 while controlling for 1994 mathematics achievement. In effect, this shows the impact of these variables on change in the mathematics achievement of schools.

Table 3 shows the regression equation using 1997 school and student background variables. The selectivity index was deleted from this equation, as it is not statistically significant in predicting the schools' mathematics IGAP score when holding the 1994 score constant. Change in mathematics achievement in selective schools did not differ from regular schools.

Examining the unstandardized coefficients, which show the size of the effect on 1997 mathematics IGAP scores while controlling for 1994 scores, it appears that the importance of student background factors is reduced compared to the static analysis. In accordance with the Sanders' Tennessee studies (1992), the size of the effect of socioeconomic factors on mathematics achievement is smaller than in cross-sectional analysis (for percent low-income, for instance, b goes from –1.023 to -.428). "Focus on student learning" is again the most substantively significant of the school variables, and this is in line with the effective school research.

Table 3

Regression of School and Student Background Variables with
1997 Average School IGAP in Mathematics,
Controlling for 1994 Mathematics IGAP

Table of Coefficients

| | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|
| Variables | B | Std. Error | Beta | | |
| (Constant) | 126.979 | 13.541 | | 9.377 | .000 |
| Mathematics IGAP, 1994 | .587 | .034 | .588 | 17.031 | .000 |
| | | | | | |
| School Climate Variables | | | | | |
| Focus on Student Learning | 5.421 | 1.389 | .145 | 3.904 | .000 |
| School Commitment | 3.756 | 1.404 | .110 | 2.675 | .008 |
| Inclusive Leadership | -2.624 | .727 | -.113 | -3.610 | .000 |
| Student Background Variables | | | | | |
| Percent Low-Income Students | -.428 | .094 | -.170 | -4.538 | .000 |
| Percent Black | -.268 | .062 | -.242 | -4.313 | .000 |
| Percent Hispanic | -.180 | .073 | -.130 | -2.452 | .015 |

Model Summary: $R = .930$, $R^2 = .865$, Standard Error of the Estimate = 177.55
Mean Math IGAP: 226.31; standard deviation: 47.10
$F(7,386) = 347.426$; significance < .001

Table 4 provides an analysis of the relative contribution of the groups of variables to the explained variance for 1997 IGAP mathematics scores. The last column of the table provides the percentage contribution to the explained variance of each set of variables. Omitting the explained variance of the Math IGAP variable in 1994 to distribute the variance between the two relevant factors, school climate and student background, student background still remains by far the most significant factor in accounting for mathematics achievement (68.7%).

Indeed, student background factors explain a larger percentage of the variance in mathematics achievement in the longitudinal analysis (68.7%) than in the cross sectional analysis (57.52%). This is contrary to what would be expected based on Sanders' classroom studies in Tennessee (1992). This reduction is due, in part, because the "Teacher Belief" variables are left out of the longitudinal equation because they are not significant when the prior mathematics score is controlled.

Table 4

Hierarchical Partitioning of Explained Variance, Mathematics IGAP 1997
Student Characteristics, School Variables, and Math IGAP 1994

| Predictor Variables | Explained Variance, Entered Alone ($R^2$) | Unique Contribution ($R^2$ Change) | Independent Contribution | Percent Independent Contribution |
|---|---|---|---|---|
| | | | | |
| Math IGAP 1994 | .797 | .182 | 0.409 | 47.30 |
| School Climate Variables[a] | .352 | .054 | 0.143 | 16.50 (31.3)[c] |
| Student Background Variables[b] | .694 | .017 | 0.313 | 36.20 (68.7)[c] |
| Total | | | 0.865 | 100.00 |

[a] School Commitment, Focus on Student Learning, Inclusive Leadership
[b] Percent Low-income, percent black, percent Hispanic
[c] Percentage not including Math IGAP 1994

## Conclusions

The current analysis shows that school variables make a significant contribution to the explained variance in student mathematics achievement in Chicago Public Schools. The contribution of school climate variables is about 19%, and teacher beliefs contribute about 24%. The contribution of socioeconomic variables is 57%. Teacher beliefs are not combined with the school climate factor, as they can be interpreted in different ways: They reflect beliefs of teachers about student ability and family participation in schooling. They may reflect prejudicial attitudes of teachers or accurate perceptions of teachers of reality. Since such attitudes do assume the power of a self-fulfilling prophecy, both interpretations are likely to be valid.

When controlling for prior achievement in mathematics, socioeconomic variables continue to be the major contributor to the explained variance in mathematics instruction. The findings of Sanders at the classroom level in Tennessee are not replicated at the school level in Chicago. Improvement in mathematics achievement tends to be greater in more affluent schools with fewer minority students.

There are, of course, schools in Chicago in which student achievement has soared as a result of leadership changes and consequent changes in school climate, and without changes in the composition of the student body. This researcher is currently studying such schools in Chicago, in which principals have won outstanding educator awards. These are the kinds of outlier schools studied in the effective schools research. Schools can make a major difference. The current study shows that, on average, their effect is considerably smaller than the effect of student background. It takes truly exceptional principals to organize a school and its staff to overcome the negative effect of poverty and minority status in this society. What we need is a way to replicate these exceptional principals and schools so that they become the norm.

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## Appendix

**Items in School Variables in Consortium Survey**

- School Commitment
  - •Wouldn't want to work in any other school
  - •Would recommend this school to parents
  - •Look forward to each working day at this school
  - •Feel loyal to this school
- Focus on student learning
  - •Really works at developing students' social skills
  - •Focuses onwhat's best for student learning
  - •Has well defined learning expectations for all students
  - •Sets high academic standards
  - •Organizes school day to maximize instructional time

- Inclusive leadership of Principal …
  - •is strongly committed to shared decision making
  - •works to create a sense of community in the school
  - •promotes parent and community involvement

- Parent Involvement
  Most of my students' parents…
  - •volunteered to help in classroom
  - •helped raise funds for school
  - •Attend school-wide events
  - •Attend parent/teacher conferences
  - •Picked up child's report card

- Limited Capability of Students
  - •students not capable of learning the material I am supposed to teach
  - •how much a student learns depends on natural ability
  - •obstacles to teaching: Student problems beond my influence
  - •my students are not ready for "higher order" learning until they have learned basics

**Table of Correlations for Variables in Model**

| | Math 97 | Math 94 | Loinc97 | Black97 | Hisp97 | Mobil97 | Select | Focus | Commit | Leader | Capable | Parent |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Math 1997 | 1.00 | 0.90 | -0.79 | -0.48 | 0.13 | -0.49 | 0.40 | 0.54 | 0.56 | 0.31 | -0.32 | 0.67 |
| | | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Math 1994 | 0.90 | 1.00 | -0.79 | -0.40 | 0.08 | -0.49 | 0.41 | 0.46 | 0.48 | 0.28 | -0.28 | 0.66 |
| | 0.00. | | 0.00 | 0.00 | 0.13 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Low Income | -0.79 | -0.79 | 1.00 | 0.27 | 0.13 | 0.49 | -0.41 | -0.35 | -0.35 | -0.19 | 0.26 | -0.58 |
| | 0.00 | 0.00. | | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Black | -0.48 | -0.40 | 0.27 | 1.00 | -0.86 | 0.21 | -0.05 | -0.27 | -0.41 | -0.18 | 0.02 | -0.50 |
| | 0.00 | 0.00 | 0.00. | | 0.00 | 0.00 | 0.29 | 0.00 | 0.00 | 0.00 | 0.76 | 0.00 |
| Hispanic | 0.13 | 0.08 | 0.13 | -0.86 | 1.00 | -0.02 | -0.02 | 0.11 | 0.23 | 0.10 | 0.04 | 0.29 |
| | 0.01 | 0.13 | 0.01 | 0.00. | | 0.72 | 0.70 | 0.03 | 0.00 | 0.05 | 0.48 | 0.00 |
| Mobiity | -0.49 | -0.49 | 0.49 | 0.21 | -0.02 | 1.00 | -0.29 | -0.25 | -0.28 | -0.12 | 0.19 | -0.43 |
| | 0.00 | 0.00 | 0.00 | 0.00 | 0.72. | | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 |
| Selectivity | 0.40 | 0.41 | -0.41 | -0.05 | -0.02 | -0.29 | 1.00 | 0.19 | 0.16 | 0.08 | -0.24 | 0.28 |
| | 0.00 | 0.00 | 0.00 | 0.29 | 0.70 | 0.00. | | 0.00 | 0.00 | 0.11 | 0.00 | 0.00 |
| Focus on Learning | 0.54 | 0.46 | -0.35 | -0.27 | 0.11 | -0.25 | 0.19 | 1.00 | 0.84 | 0.74 | -0.29 | 0.53 |
| | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.00 | 0.00. | | 0.00 | 0.00 | 0.00 | 0.00 |
| School Commitment | 0.56 | 0.48 | -0.35 | -0.41 | 0.23 | -0.28 | 0.16 | 0.84 | 1.00 | 0.75 | -0.25 | 0.54 |
| | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00. | | 0.00 | 0.00 | 0.00 |
| Inclusive Leadership | 0.31 | 0.28 | -0.19 | -0.18 | 0.10 | -0.12 | 0.08 | 0.74 | 0.75 | 1.00 | -0.19 | 0.37 |
| | 0.00 | 0.00 | 0.00 | 0.00 | 0.05 | 0.02 | 0.11 | 0.00 | 0.00. | | 0.00 | 0.00 |
| Limited Student Capability | -0.32 | -0.28 | 0.26 | 0.02 | 0.04 | 0.19 | -0.24 | -0.29 | -0.25 | -0.19 | 1.00 | -0.34 |
| | 0.00 | 0.00 | 0.00 | 0.76 | 0.48 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00. | | 0.00 |
| Parent Involvement | 0.67 | 0.66 | -0.58 | -0.50 | 0.29 | -0.43 | 0.28 | 0.53 | 0.54 | 0.37 | -0.34 | 1.00 |
| | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00. | |

N = 382